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Putting Digital Literacy in Practice: How Schools Contribute to Digital Inclusion in the Network Society

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In the sociology of childhood and youth, children have been conceptualized as passive subjects on hold, still in the process of becoming—rather than in an effective state of being. In effect, children have been conceptualized as the subjects rather than the objects of the research process. This influence got carried over to digital divide research. The latest thinking in the field has started to define and understand children and young people as heterogeneous, nonpassive, autonomous, diverse, and versatile agents actively appropriating the Internet in meaningful contexts of their everyday lives. This article seeks to move the discourse forward via four parallel binary logistic regressions that assess diverse and socially mediated opportunities needed to learn basic digital skills from a representative sample of 6,602 primary and secondary students from 350 schools and high schools in Catalonia, Spain. Our research shows that the school appears to be playing a secondary role, as compared with children and young people's social practice in heterogenic contexts of everyday life, not only for Internet training but also for providing opportunities to develop and master basic digital skills.

Keywords children and young people, community, digital inequalities, digital literacy, Internet, network society, schools

> Education is the action exercised by the adult generations over those that are not yet ready for social life. Its purpose is to arouse and develop in the child a certain number of physical, intellectual and moral states which are demanded of him both by the political society as a whole and by the specific environment for which he is particularly destined. (Durkheim 1992, 51)

After a period of hype in the mid-1990s that highlighted the benefits of the Internet, policymakers, advocacy groups, and scholars initiated and fueled a vigorous debate around the concept of "digital divide" (for opposing views see Norris 2001; Compaine 2001). Indebted to classical formulations of the knowledge gap hypothesis,[1] digital exclusion was initially defined in terms of the growing and widening divide between those who "have" access to the information and communication technologies (ICT)—mainly the Internet—and those who "have not" (see initial and influential studies by National Telecommunications and Information Administration [NTIA] 1995; 1998). Consequently, we have a wealth of research that documents social, economic, and demographic differences with respect to ICT access (Cooper and Weaver 2003; Fairlie 2004; Hindman 2000; Losh 2003; Martin and Robinson 2004; Wilson, Wallin, and Reiser 2003).

Persistent patterns of differential technology use were later added into the operationalization of the digital exclusion (among others, see subsequent paper series from NTIA or later annual studies by the University of California, Los Angeles (UCLA), Center for Communication Policy starting in 2000; for some good reviews of the subject, see also Haythornthwaite and Wellman 2002; Castells 2001; Lentz 2000). Thereby, "digital divide" scholars took an important step in refining their objectives and turning their attention away from what the technologies—media in Katz's (1959) original formulation—would do to people, to what people are actually doing with them. Consequently, a growing research area has developed in which differences in Internet use—beyond income inequalities—have been examined with regard to gender, race, educational level, life stage, and even bandwidth of Internet connection (see, e.g., Boneva, Kraut, and Frohlich 2001; Dwivedi, Choudrie,

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and Brinkman 2006; Jackson, Ervin, Gardner, and Schmitt 2001; Kennedy, Wellman, and Klement 2003; Nakamura 2004; Robinson, DiMaggio, and Hargittai 2003; Wasserman and Richmond-Abbott 2005).

Unfortunately, because of its pragmatic dependence on the approach borrowed from the original and well-discussed knowledge gap hypothesis (for some good revisions of evidence on this subject[2] see Gaziano 1983; 1997), the "digital divide" paradigm was not an adequate platform for fulling understanding the causes of the unequal appropriation of the Internet. At the turn of the millennium, with the progressive introduction and diffusion of ICT in societies, the debate had to be renewed. Emergence of new forms of inequality spotlighted the shortcomings of the old conceptual framework. Lievrouw and Farb (2002) characterized them as the limitations of the vertical or hierarchical approach to inequality, where greater social and economic advantages are still mechanically associated to a better access to or use of information.

Nevertheless, the successive extensions of the old and obsolete "haves" versus "have-nots" metaphor helped develop the necessary background for expanding a brand-new approach based on a more complex definition of inequality. The Internet user could no longer be defined as a black-or-white issue derived from a binary conceptualization of access, and, consequently, many scholars increasing saw the divide as a blurred and ever-changing boundary (Lenhart and Horrigan 2003; Wyatt, Thomas, and Terranova 2002). But even more important, researchers started to develop and embrace a complex approach to what was formerly referred to as the "digital divide," remapping inequality as a multidimensional phenomenon (among others, see van Dijk 2005; van Dijk and Hacker 2003; DiMaggio and Hargittai 2001; DiMaggio et al. 2004; Lievrouw 2000; Steyaert 2002; Warschauer 2003).

Consistent with empirical research developed to test the knowledge gap hypothesis, there is no proven gain in retaining the binary and access-based operationalization underlying the "digital divide," where a purely technological solution—that is, in access policies, providing computers or Internet subscriptions—appear to be a deterministic, limited, and wasteful answer for the wrong sociological question. When access is not the only concern, "digital inequalities" should be seen as lying in and explained in terms of differences between individuals or social groups in motivation, abilities, access, and effective use.

This is the perspective from which the analysis of the role of the school in the promotion of digital inclusion of children and young people in the network society will be undertaken. The focus will be on the inequality in the acquisition and mastering of basic skills required to develop meaningful uses of the Internet.

DIGITAL INEQUALITIES IN CHILDREN AND YOUNG PEOPLE

In spite of the relatively recent academic interest in developing a true and renewed sociology of childhood and youth (James and Prout 1997; Prout 2005), during the last decades of the twentieth-century childhood has rarely been analyzed as a subject in its own right. Most of the research has been undertaken via a partial and indirect approach wherein scholars have systematically failed to define children and young people as the objects rather than the subjects of the research process (Cahill 1992; Johnson 2001; Qvortrup 2005). In other words, children have been conceptualized as passive subjects on hold, still in the process of becoming—rather than in an effective state of being. This approach has been criticized for being poor, limited, and deterministic (James, Jenks, and Prout 1998; for an interesting review of the subject ,see Corsaro 2005).

Likewise, information and communication technologies have not been free of these scholarly, policy-related, and popular conceptions of children and young people (Buckingham 1998; Facer, Furlong, Furlong, and Sutherland 2001; Selwyn 2003). However, in spite of these limitations, a modest but growing body of research has been trying to push old assumptions and concerns toward a new kind of debate centered on effective Internet access and use by children and young people (for a comprehensive review of the literature see Livingstone 2002, 2003). The latest thinking in the field has started to define and understand children and young people as heterogeneous, nonpassive, autonomous, diverse, and versatile agents actively appropriating the Internet in meaningful contexts of their everyday lives.

Strongly influenced by the digital divide approach discussed already, social researchers have started to address broader implications of the digital exclusion. Here one has to acknowledge works such as the initial writings by Koss (2001), Facer and Furlong (2001), and Valentine, Holloway, and Bingham (2002), which helped draw attention to digital exclusion issues in children and the importance of the school's negotiation of Internet use. In addition, empirical works by Facer, Furlong, Furlong, and Sutherland (2001), Holloway and Valentine (2003), Judge, Puckett, and Cabuk (2004), and Cleary, Pierce, and Trauth (2006) contributed to enhance this understanding by focusing on the important influence of home access.

Furthermore, as was the case for the research on the digital divide in adult populations, scholars increasingly included differences in terms of use (besides the literature reviews cited earlier, see recent studies by Lenhart and Madden 2005; Lenhart, Madden, and Hitlin 2005; Mediappro 2006), whether it be in schools (Levin, Arafeh, Lenhart, and Rainie 2002), in the comparison

between home and school contexts (Livingstone, Bober, and Helsper 2005; Kent and Facer 2004), or even through the specific analysis of observed differences in communication, participation, and involvement (Livingstone and Bober 2004). However, further steps to develop a richer approach to digital exclusion in children and young people have not been forthcoming. Certainly, besides the interesting contexts and formulations in the previously mentioned works, inequalities other than ICT access or use and complex explanations involving specific appropriation of the Internet by children and young people as active agents in their everyday life are still not so common.

This is the framework within which we developed the study presented in this article. An empirical analysis of the school's contribution to promote children's and young people's present and future inclusion in the network society was its ultimate objective. To do so, we adopted a complex approach to what has been referred to as "digital divide," remapping inequality as a multidimensional phenomenon, specifically focusing on the development of digital literacy in practice. More particularly, we analyzed the capacity of the school—compared to other contexts of their everyday life—to become a context of Internet practice in which the acquisition and development of the basic digital skills are possible.

Paying close attention to the evolution of the concept of literacy over recent decades (United Nations Educational, Scientific and Cultural Organization 2003), one may claim that it was initially considered a simple notion conceived as the set of technical skills—reading, writing, and calculating—to become, over time, a more plural one that encompasses multiple dimensions and meanings of these crucial competences for living in society. In this sense, the early promotion of massive training programs oriented to increase the populations' productivity resulted in a heated debate that led to a broader consideration of the social dimensions of the acquisition and application of literacy to enable individuals to participate fully in their community and, more widely, their society (UNESCO 2004). That is to say, it was necessary to expand its definition to refer to a multidimensional and complex process that is situated in and shaped—in a dynamic fashion nonetheless—by culture, language, and socioeconomic conditions (Street 2003).

According to recent formulations of the new literacy studies (Barton 1994; Gee 1992; John-Steiner, Panofsky, and Smith 1994), the acquisition and development of literacy are therefore not simply the achievement of a neutral and decontextualized cognitive ability to read and write. On the contrary, it is the development of the history-, culture-, and context-dependent abilities to master the informational and communicational processes in social practice (see de Castell and Luke 1986, for a revision of the evolution of the ideological basis of literacy in educational contexts). The acquisition of literacy and application is, in this sense, a learning practice embedded in, and interwoven into, wider and irremediably social practices developed in meaningful settings (Cook-Gumperz 2006; Heath 1983; Lave 1988; Wells 1981).

Thus, expanding this framework to the specific case of the development of digital literacy and its application in the network society, our intention is to construct and empirically test an exploratory model for the acquisition of some basic Internet skills in children's and young people's practice. In this sense, for the analysis of inequalities in digital literacy, we will be able to explore the specific contribution of their Internet use in everyday-life contexts—in and out of the school—as they become potential opportunities to access and develop active and meaningful appropriations of the Internet. Interestingly, after controlling for sociodemographic characteristics, we will also be able to take account of the specific effects for every context of digital practice as an explanation of these inequalities, to finally identify the school's contribution to their present and future digital inclusion.

METHOD

This research has been conducted as part of the Catalonia Internet Project[3] (PIC in its Catalan initials): School in the Network Society, a larger exploratory study of the specific traits in the introduction of the Internet into schools and high schools in Catalonia, Spain. The PIC's main objective is to address the contribution of the Internet to a new educational culture adjusted to the new requirements of the network society (Mominó, Sigalés, and Meneses 2008). The study's fieldwork was conducted in 2002–3 with the support of the Department of Education of the Generalitat de Catalunya (Catalonian Government) and the Jaume Bofill Foundation.

Participants

From a statistically representative sample of 350 nonuniversity educational centers in Catalonia, 6,602 children and young people completed an in-class, in-depth, self-administered questionnaire assisted by a teacher and research staff (for a discussion about the viability and quality of information reported by children in self-administered surveys, see Borgers, de Leeuw, and Hox 2000). Participants ranged from compulsory primary education (2,918 who were between eleven and thirteen years old), to compulsory secondary education (1,883 who were between fourteen and sixtten years old), postcompulsory education (1,269 who were between sixteen and eighteen years old), and vocational education (542 who were sixteen years old or older).

Measures

Sociodemographics. Participants were asked to provide basic demographic information. Questions included in this article concerned children's age and gender, school's type of funding—how their school is funded (public or private)—and their stage of education (grouped in compulsory primary education, compulsory secondary education, and postcompulsory education). Due to the fact that the participants—among whom there were eleven-year-old children—were responding to such a self-administered questionnaire, standard adult income questions were not applied.

Digital literacy. Participants were asked to choose from a list of Internet-oriented, digital-literacy measures related not only to informational but also communicational practices with and within informational networks supported by the Internet. In other words, they were asked about their ability in the following four areas: use of a Web search engine, downloading files, accessing and participating in a chat, and sending an e-mail. All responses, coded as four dichotomic indicators, served as proxies for observed skill measures, which are much less expensive and less difficult to collect for large samples, but have also proven to be better predictors compared to other traditional proxy measures such as self-perceived abilities (Hargittai 2005).

Context of basic Internet training. Participants were asked to provide information about from whom they learned (if so) how to use the Internet. Accordingly, they were asked whether they had acquired basic Internet skills at the school, in their household, by receiving private lessons, from their informal network of friends, whether they taught themselves, or whether they actually did not know.

Effective Internet use in everyday settings. Focusing on the schools' contribution to their digital inclusion, children and young people were also asked to provide information about their specific use of the Internet in class (during regular classes), school (within the premises at any time other than their regular classes), and outside the school (any other use outside the formal context of the schools and high-schools, i.e., at their own home, their friends' or relatives' homes, a public library, or an Internet café). This gave us the opportunity to focus our analysis on the role of educational institutions in providing contexts for meaningful uses of the Internet. In general, people were asked to provide information about effective Internet use by frequency (daily, weekly, monthly, never), disregarding the specific location where this use took place. Nevertheless, compared to class and outside-school time, the school at any time other than their regular classes is not such a common context for Internet use in primary and secondary education. Accordingly, because of the exploratory nature of the study, an alternative access measure was originally selected (always, periodically, never available).

Analysis

In spite of the initial exploratory nature of the project, results presented in this article do include multivariate data analysis (logistic regression models). After descriptive explorations and initial bivariate analysis, dependence techniques have been considered to make inferential judgements and test separate effects of multiple independent variables. Because of the dichotomy of dependent variables and given the nonmetric nature of independent variables considered in our analysis, four parallel binary logistic regressions have been modeled for each of the digital literacy indicators selected. Only independent variables with statistical significant bivariate relationships have been considered (see the chi-squared tests in tables 1 and 2).

Briefly, binary logistic regression is a special type of multiple-regression analysis developed to predict the probability for an event to occur—coded "0" when the condition is not satisfied or "1" when it is—dealing with the special properties of its binary nature that violate the assumptions of multiple regression (Long 1997). Through this analysis, one is able to describe and test relationships between digital literacy indicators and (a) sociodemographic information, (b) the context of basic Internet training, and (c) the appropriation of the Internet in the class, in the school during hours other than regular class time (hereafter referred to as "in-school time"), and anywhere else than the school ("outside the school" hereafter). By controlling for the effects of every independent variable considered in the models, one is also able to provide estimated individual logistic coefficients, significance tests (Wald statistic), and exponentiated logistic coefficients (antilog transformation).

The overall significance of all the four logistic models has been tested using the criteria of significant reduction in the log likelihood value (–2LL). In addition, Hosmer and Lemeshow (2000) tests showed no significance for the four final models, indicating that no significant differences between actual and expected values remain. However, as chi-squared tests are particularly sensible to sample size, pseudo R^2 measures (Cox and Snell R^2 and Nagelkerke R^2) and overall classification accuracy are also provided at reader's discretion for assessing the goodness-of-fit of the final estimated models. With this respect, the final models show an acceptable adjustment, with the percentage of variance encountered ranging from at least one-third to one-half using Nagelkerke pseudo R^2 estimations.

FINDINGS

Even in the most optimistic discourse concerning the relationship between technology and children and young people, deterministic conceptions can be found that consider them as having an effortless ability to use ICT, thus making them be the very vanguard of the digital revolution. Instead of considering the heterogenic nature of their adoption and appropriation of the Internet, simplistic representations easily crystallize into common knowledge through the flashy but shallow metaphor of the child computer user or cyber-child. However, as we discussed earlier with regard to the urgency of empirical studies about significant appropriations in everyday life, neither recent academic studies nor the results we present here support these views about childhood and youth in the network society.

On the contrary, far from being a fact, column marginal totals and significant bivariate analyses (see table 1) give support to an unequal distribution of basic digital practices. First, one must point out that individual digital literacy indicators do not seem to be equally comparable in overall population distribution. In this sense, knowing how to use a search engine (89.4 percent) or how to engage in a chat (84.7 percent) seem to be easier practices for children and young people to acquire than knowing how to send an e-mail (71.7 percent) or how to download a file from the Internet (67.5 percent). Additionally, after inspecting basic digital skills distribution by subpopulations, not only is there no cell in table 1 where all participants have acquired a skill, but we also find that the same distribution of basic digital skills acquisition can be observed by age, gender, and school's type of funding. No matter what categories we observe, knowing how to use a search engine is the most common skill, while how to download a file is the least.

As expected, children and young people definitely appear not to be a homogeneous group with regard to digital literacy. Consequently, significant statistical differences can also be observed between subpopulations when control variables are introduced (see significance levels in table 1). In short, chi-squared tests reveal that males are systematically better than females—except in their ability to participate in a chat; here differences in aptitude between the genders are not significant—and older students (secondary education, compulsory or not) are better than younger students (primary education). The same holds true for the type of funding of the institution attended, where participants from private schools and private high schools report a significantly greater item-by-item knowledge than students attending public institutions.

After observing the unequal distribution of basic digital practices in children and young people, and after the discussion of significant basic sociodemographic differences, our second concern is to further outline the schools' contribution to digital literacy. Advancing earlier discussions

TABLE 1
Basic digital skills by demographic information (%)

Demographic information	Knows how to use a search engine	Knows how to download a file	Knows how to participate in a chat	Knows how to send an e-mail	Row marginal totals
Stage of education					
Primary	80.9	54.6	71.7	53.4	43.9
Compulsory secondary	94.6	78.5	94.8	84.5	28.5
Postcompulsory	97.3	76.5	95.0	87.7	27.6
χ^2 (df = 2)	358.740[c]	357.204[c]	620.806[c]	793.274[c]	
Gender					
Female	87.8	59.6	84.1	69.9	51.5
Male	91.0	75.9	85.4	73.7	48.5
χ^2 (df = 1)	16.017[c]	182.461[c]	1.753	10.770[c]	
Funding					
Public	87.2	62.9	81.9	68.3	55.0
Private	92.0	73.1	88.2	76.0	45.0
χ^2 (df = 1)	37.323[c]	71.045[c]	45.144[c]	44.280[c]	
Column marginal totals					
Percentage	89.4	67.5	84.7	71.7	100.0
n	5,407	4,082	5,128	4,343	6,062

Note. The binary dependent variables are coded as no (0) and yes (1).
[a]Significant at $p < .05$.
[b]Significant at $p < .01$.
[c]Significant at $p < .001$.

about disparities between households and schools, two different approaches are taken here. First, an assessment of the school contribution as a reported place for basic Internet training is undertaken, complemented with a detailed description of the concrete and effective appropriation of the Internet during regular classes and in-school time. Second, after analyzing Internet use among children and young people, logistic regression models are developed and tested to measure the specific contributions of class and in-school time to digital literacy acquisition with appropriate controls.

On the one hand, as can be seen in the row totals of table 2, participants reported that school (23.0 percent) was the second-most frequent context for their basic Internet training, second only to those who asserted that they are self-taught (30.7 percent). However, far from ordinal considerations, if we have a look at the data as a whole, we can see that children and young people are getting basic Internet training significantly more often in the household, receiving private lessons, with friends, and by self-teaching all together (72.4 percent) than in the formal educational environment of schools and high schools.

On the other hand, still referring to the row totals, there are also some significant differences in Internet use by context; we can see that in-school settings (class and in-school time) are providing dramatically fewer opportunities for students to access and use the Internet than outside the school contexts. In this respect, for example, comparing daily Internet use, the proportion of Internet users decreases from just over one fourth (27.6 percent) outside the school, to nearly one fiftieth (1.8 percent) during class time. The same holds for any other level considered,

TABLE 2
Basic digital skills by context of acquisition and Internet use (%)

Parameter	Knows how to use a search engine	Knows how to download a file	Knows how to participate in a chat	Knows how to send an e-mail	Marginal totals
Context of acquisition					
Does not know	19.7	10.8	24.2	7.2	4.6
School	84.4	50.2	73.6	49.8	23.0
Household	94.0	68.7	85.1	75.8	19.7
Private lessons	92.1	76.7	90.4	74.6	4.8
With friends	92.0	67.0	93.1	76.5	17.2
Self-taught	98.7	86.9	96.3	92.1	30.7
χ^2 (df = 5)	1664.384[c]	929.703[c]	1173.592[c]	1306.040[c]	
Internet in classroom					
Never	85.3	67.0	83.8	71.1	36.5
Monthly	92.1	68.1	86.9	74.0	34.7
Weekly	91.3	66.9	83.2	69.6	26.9
Daily	90.8	71.6	83.5	72.5	1.8
χ^2 (df = 3)	62.373[c]	1.654	12.163[c]	9.713[a]	
Internet in school					
Never	86.2	64.2	81.1	66.1	59.4
Periodically	93.8	72.3	89.7	80.0	38.5
Always available	96.2	70.2	94.7	80.9	2.2
χ^2 (df = 2)	92.239[c]	42.714[c]	91.616[c]	140.952[c]	
Internet outside the school					
Never	61.2	33.1	51.9	27.1	17.6
Monthly	90.9	57.4	84.6	64.9	33.7
Weekly	97.4	77.6	94.0	85.8	21.1
Daily	99.3	94.0	98.7	97.7	27.6
χ^2 (df = 3)	1155.899[c]	1259.937[c]	1222.059[c]	1772.859[c]	
Column marginal totals					
Percentage	89.4	67.5	84.7	71.7	100.0
n	5407	4082	5128	4343	6062

Note. The binary dependent variables are coded as no (0) and yes (1).
[a]Significant at $p < .05$.
[b]Significant at $p < .01$.
[c]Significant at $p < .001$.

ranging from 82.4 percent (outside-school Internet users) to 63.5 percent (class-time Internet users), whatever their frequency of use.

To summarize our results, compared with other contexts in the everyday life of children and young people, the school is found to be the second most important place for initial Internet training and, particularly for class time, a relatively common context in which to access and use the Internet. However, informal settings outside the school still represent more widespread contexts of online activity, where both initial training is provided and the higher levels of Internet access and use are observed. In other words, with respect to children's and young people's reported appropriation of the Internet, in-school contexts matter, but other settings outside the school appear to be even more important.

Additionally, beyond our descriptive results, we are also able to provide different levels of association between basic digital skills and place of acquisition, and between levels of Internet use in children's and young people's everyday life. Observing cell percentages and bivariate significance levels provided in table 2, we can see that there is a consistent, statistically significant relationship with respect to every digital skill ($p < .001$). In general, participants who received basic Internet training in formal educational contexts are systematically reporting the lowest level of Internet-related abilities, ranging from 84.4 percent to 49.8 percent. Consequently, those who learned in the household, received private lessons, with friends or who are self-taught, are significantly more fluent in selected digital practices whatever the indicator we take into account.

Simultaneously, concerning our approach to literacy as a sum of social practices acquired in socially organized and meaningful contexts, additional significant bivariate relationships have consistently been observed with respect to Internet access and use outside the school ($p < .001$), and in-school time ($p < .001$). Internet class time, although it is statistically related in some cases, does not show such a constant and strong relationship with selected digital practices. With this respect, and clearly for in and outside the school Internet use, whenever a relationship is found, more frequent Internet use is consistently associated with higher levels of digital literacy (see the corresponding percentages in table 2).

However, to continue our analysis of the contribution of schools to digital literacy acquisition in practice, we developed and tested four parallel multivariate logistic models to overcome the limitations of bivariate analysis. With the appropriate sociodemographic controls, and holding for other effects considered in logistic regressions, we are able to explain how changes in every independent variable are related to the different probabilities of having acquired each of the specific skills considered. However, because of the limitation of space, we do not comment on each of the partial logistic coefficients. Instead, our analytic strategy is to assess horizontally the particular contributions of each variable in every indicator, giving the opportunity to the interested readers to check specific details at their own discretion (see table 3).

First, paying attention to sociodemographic variables, one can see that the children's age has the most significant and consistent influence ($p < .001$), while gender and type of funding seem to play a more secondary role with fewer variations. In fact, in comparison to the bivariate analysis discussed earlier, older students remain systematically better, whatever the informed skills we analyze. For example, controlling for the other variables in the model, the odds ratio of post-compulsory students ranges from 1.418 to 6.046, when compared with values for primary students (see second row in table 3). These Exp(B) values indicate that the odds of being skilled for older students in the sample are, on average, from 41.80 percent to 504.6 percent higher depending on the indicator observed.

On the contrary, concerning the gender differences initially observed, it seems that girls and boys are fairly comparable (see third row in table 3), especially for communicational practices where differences become statistically significant. However, as for the ability to make use of a Web search engine or to download a file, the odds of male participants are, respectively, 48.90 percent and 118.00 percent higher than their female counterparts. Also, although private school students seem more skilled compared to participants from publicly funded institutions, it does not exceed an odds ratio value of 1.338 (33.8 percent more likely) in the best case, controlling for all the other explanatory variables.

At this stage, we may analyze the effect of the place of basic Internet training, where all the different settings—namely, the school, the household, private lessons, with friends, or self-taught—are compared to the number of participants who indeed reported they never had the opportunity to learn how to make use of the Internet. If we focus on the results presented in the horizontal rows (see fifth row in table 3), there is a consistent and statistically significant relationship with this primary place of basic training ($p < .001$). According to the initial bivariate results, the best positions are always for everyday settings other than the school, which never goes beyond the fourth position in the best situations, with Exp(B) values ranging from 4.841 to 11.847.

Undoubtedly, these values respond to large logistic coefficients, but it is important to bear in mind that the comparison group is formed of counterparts who said they were not given any guidance when learning how to use the Internet. Controlling for every other independent variable considered in the models, learning in informal settings is associated with more highly skilled children and

TABLE 3
Logistic regression for digital literacy in children and young people by sociodemographic controls and Internet use in class, in school, and outside school

	Knows how to use a search engine (1)			Knows how to download a file (2)			Knows how to participate in a chat (3)			Knows how to send an e-mail (4)		
Parameter	B (*SE*)	Wald	Exp(B)	B (*SE*)	Wald	Exp(B)	B (*SE*)	Wald	Exp(B)	B (*SE*)	Wald	Exp(B)
Intercept	–2.590 (0.193)	179.643[c]	0.075	–2.844 (0.205)	191.982[c]	0.058	–1.915 (0.170)	127.606[c]	0.147	–3.392 (0.250)	184.790[c]	0.034
Stage of education												
Primary	—	—	—	—	—	—	—	—	—	—	—	—
Compulsory secondary	0.990 (0.154)	41.078[c]	2.691	0.505 (0.089)	32.279[c]	1.656	1.393 (0.138)	102.348[c]	4.028	1.006 (0.099)	103.730[c]	2.734
Postcompulsory	1.799 (0.199)	81.403[c]	6.046	0.349 (0.094)	13.804[c]	1.418	1.221 (0.145)	71.149[c]	3.391	1.203 (0.110)	120.096[c]	3.329
Gender												
Female	—	—	—	—	—	—	—	—	—	—	—	—
Male	0.398 (0.107)	13.867[c]	1.489	0.779 (0.066)	137.728[c]	2.180	0.017 (0.087)	0.037	1.017	0.098 (0.073)	1.805	1.103
Funding												
Public	—	—	—	—	—	—	—	—	—	—	—	—
Private	0.291 (0.110)	7.027[b]	1.338	0.264 (0.067)	15.717[c]	1.303	0.247 (0.090)	7.599[b]	1.280	0.108 (0.074)	2.096	1.114
Context of acquisition												
Does not know	—	—	—	—	—	—	—	—	—	—	—	—
School	2.472 (0.194)	162.943[c]	11.847	1.577 (0.212)	55.279[c]	4.841	1.684 (0.178)	89.929[c]	5.385	1.768 (0.253)	48.874[c]	5.861
Household	2.904 (0.226)	164.485[c]	18.256	1.784 (0.220)	65.634[c]	5.956	1.591 (0.194)	66.959[c]	4.910	2.283 (0.260)	76.856[c]	9.802
Private lessons	2.901 (0.290)	100.330[c]	18.195	2.480 (0.253)	96.365[c]	11.944	2.502 (0.267)	87.982[c]	12.202	2.498 (0.289)	74.956[c]	12.163
With friends	2.312 (0.215)	115.627[c]	10.091	1.749 (0.220)	62.942[c]	5.750	2.209 (0.207)	113.572[c]	9.110	2.073 (0.259)	64.056[c]	7.951
Self-taught	3.532 (0.277)	162.100[c]	34.194	2.394 (0.223)	114.922[c]	10.959	2.243 (0.215)	108.821[c]	9.420	2.788 (0.265)	110.792[c]	16.241
Internet in classroom												
Never	—	—	—	—	—	—	—	—	—	—	—	—
Monthly	0.630 (0.130)	23.337[c]	1.878	0.032 (0.079)	0.164	1.033	0.133 (0.110)	1.461	1.142	0.201 (0.090)	4.993[a]	1.223
Weekly	0.842 (0.139)	36.710[c]	2.322	0.226 (0.088)	6.581[a]	1.253	0.194 (0.115)	2.831	1.214	0.421 (0.098)	18.503[c]	1.523
Daily	0.116 (0.376)	0.095	1.123	0.127 (0.244)	0.271	1.135	–0.338 (0.3016)	1.216	0.713	0.047 (0.267)	0.031	1.048
Internet in school												
Never	—	—	—	—	—	—	—	—	—	—	—	—
Periodically	0.241 (0.120)	4.038[a]	1.273	0.080 (0.071)	1.273	1.083	0.125 (0.097)	1.653	1.133	0.299 (0.079)	14.225[c]	1.349
Always available	0.312 (0.518)	0.363	1.366	–0.326 (0.232)	1.978	0.722	0.591 (0.435)	1.847	1.807	–0.137 (0.277)	0.247	0.872
Internet outside the school												
Never	—	—	—	—	—	—	—	—	—	—	—	—
Monthly	0.931 (0.122)	58.600[c]	2.536	0.538 (0.092)	34.439[c]	1.713	1.025 (0.104)	96.710[c]	2.788	0.972 (0.095)	104.889[c]	2.643
Weekly	2.042 (0.208)	96.756[c]	7.706	1.348 (0.109)	154.165[c]	3.851	1.978 (0.151)	171.542[c]	7.231	2.004 (0.119)	285.570[c]	7.422
Daily	2.815 (0.329)	73.376[c]	16.700	2.595 (0.139)	350.655[c]	13.400	3.058 (0.241)	160.495[c]	21.281	3.525 (0.189)	346.696[c]	33.958
Goodness-of-fit												
Cox and Snell R^2	0.222			0.259			0.231			0.328		
Nagelkerke R^2	0.452			0.361			0.402			0.472		
Classification accuracy (%)	92.2			75.3			87.7			80.9		
Sample size	6,021			6,019			6,023			6,024		

Note. The binary dependent variables are coded as no (0) and yes (1).
[a]Significant at $p < .05$.
[b]Significant at $p < .01$.
[c]Significant at $p < .001$.

young people, reaching an independent benefit that features strongly in those that are self-taught (odds ratio up to 34.194), received private lessons (up to 18.195), and learned at the household (up to 18.256). The basic Internet training provided at schools, in this sense, seems not to be as useful as (or at least it is not better than) other contexts in children's and young people's everyday life.

Finally, to complete our analysis about the school's contribution to digital literacy, we may compare the independent effect of the three selected social, meaningful contexts from which the specific Internet appropriation was assessed. From an overall point of view, one may certainly remark that multivariable logistic regressions still give us an even worse illustration of the contribution of the formal educational system to digital literacy. Not only does Internet use in class time continue to have a weak relationship with the development of digital skills, but also bivariate statistical significance has disappeared in the case of Internet use during in-school time. Looking at the Exp(B) coefficients in both cases, values over 1.500—which would imply an odds increase of 50 percent of being digitally skilled—are in fact exceptions. In the best of the situations, compared to the odds ratios of Internet use outside the school, this is indeed a modest average effect (see the sixth and seventh rows in table 3).

Hence, our analysis demonstrates the radical influence of the last variable considered in the four parallel logistic models (see the eighth row in table 3). Indeed, if we pay attention one last time to the results presented in the horizontal rows, we can observe a consistent significant relationship with every indicator ($p < .001$), where an increment in frequency of Internet use outside the school renders the fulfillment of every basic digital skill more likely. For example, looking at the comparison between daily users outside the school and corresponding students who never go on the Internet, the odds are between 13.400 and 33.958 times more likely through the different skills considered. Unquestionably, besides the independent effects discussed before, these are very high odds ratios that clearly highlight the decisive role of family and personal background factors (as distinct from the influence of the school) in the development of "digital inequalities."

DISCUSSION

The results of this study show, first, that a multidimensional approach to digital exclusion can be very suggestive when introducing new and interesting research questions in the context of inequalities in children and young people. Answering the essential question—in Sen's (1992) words, "inequalities of what?"—our primary concern has been centered on this group's unequal opportunities to learn the basic skills needed for ICT use. Far from any mythological vision about literacy that "leads inevitably to a long list of 'good' things" (Gee 1996, 42), we have instead considered the potential benefits of digital literacy as a set of cultural practices in a networked society.

In this sense, given the fact that lately the need for policy intervention for bridging the digital divide is being questioned (Compaine 2001; Katz and Rice 2002), we have approached digital literacy as diverse and socially mediated opportunities to learn the rudiments of the Internet as a prosaic object of our culture. In other words, observing the classical relationship between social and human capital (Coleman 1988), we have shown how children's and young people's social practice in heterogenic contexts of everyday life—including, but not limited to, the schools—contributes to the creation of a particular form of human capital. Furthermore, seen from the opposite side, our analysis has focused on the acquisition and development of specific digital skills because of their potential benefit as key enablers for the present and future creation of social capital.

Thus, as a result of the characterization of children and young people as a heterogeneous, diverse, and autonomous population, our project sought to explain observed digital literacy inequalities in light of the different levels of reported appropriation of the Internet in the variegated meaningful contexts of activity. As we have shown, the school appears to be playing a secondary role not only for Internet training but also for providing opportunities to develop and master these basic digital skills. Considering our results globally, informal contexts outside the school still represent more widespread contexts of online activity, where both initial training is provided and the highest levels of access and use are observed. Furthermore, our exploratory model for digital literacy acquisition in practice showed us that Internet appropriation anywhere else other than the school plays a key role, clearly highlighting the decisive role of family and personal background factors in this particular kind of "digital inequality." That is to say, after controlling for all the independent effects, initial bivariate associations with Internet appropriation in schools become a statistical artifact, especially for Internet use during in-school time.

In other words, with respect to children's and young people's reported appropriation of the Internet, in-school contexts matter, but other settings outside the school appear to be even more important. In fact, the question of the school's contribution has been a critical point for some of the cutting-edge arguments against the utopian and deterministic visions underlying the continuous and generous investment in equipping and wiring schools (see Burns and Ungerleider 2003; Cuban 2001; Cuban, Kirkpatrick, and Peck 2001; see also Cuban 1986, for a critical review of educational computing innovations from a historical perspective). Limited impact of technology on daily activities

in the classrooms and its unspecified and mostly unevaluated contribution to the intended educational outcomes are the main arguments against the massive introduction of ICT in schools. Nevertheless, our results do not imply that our model of digital literacy in practice would become unsupported by empirical evidence, and that we consequently should reduce the presence of the Internet in schools.

On the contrary, what logistics models stress is the extreme influence of digital practices outside the school and, consequently, the necessity for us to look more closely at the kind of access and use promoted in schools, both in class time and in school time, to reduce one of the many forms of background inequalities. Additional research must allow us to explore these issues in more depth, increasing our knowledge about digital exclusion and, in this context, about the role of educational institutions as instruments for societies to promote the digital inclusion of children and young people.

CONCLUSION

In spite of it being an area in which we have more and more access to empirical evidence that supports academic and public debates, the eagerness to know in detail and explain appropriately the observed "digital inequalities" must lead us on, ultimately, toward a better understanding of the digital exclusion phenomenon. As we have discussed in this article, such a complex yet dynamic question requires a multidimensional approach in which we must restrain ourselves from considering the role of socioeconomic factors from a simplistic perspective. Further, it is indispensable to continue exploring the multiple relations between social and digital inequality while simultaneously trying to analyze scientifically the experiences and subjective meanings underlying inclusion and exclusion (Wyatt, Henwood, Miller, and Senker 2000).

This has thus been guiding the modest contribution proposed in this article, in which we have analyzed and discussed primary data reported by a significant sample of children and young people surveyed from a representative sample of 350 schools from Catalonia. However, additional research, possibly of a qualitative nature, is needed to take a step further beyond our exploratory results to continue developing a sociology of childhood and youth that is also interested in the specific signification that they grant to the digital exclusion in our society. Obviously, being digitally literate is not the only condition for achieving information literacy, since mastering a computer has never been enough for acquisition of the latter (Bawden 2001). However, it does mean that we should consider digital literacy more carefully, and put it in practice for children's and young people's present and future digital inclusion, together with other basic information-processing competences and communication abilities taught in the school in the network society.

As we have tried to show, in a society that is being progressively organized by means of informational and communicational networks, this is the kind of prerequisite under which unequal opportunities should definitely be prevented or, at least, properly compensated by our educational institutions. At least, far from the hypothetical and deterministic benefits derived from strict technological approaches to digital exclusion, it would be possible to take a step further and actually conceive children and young people as active members of society: not only becoming, but being as well.

NOTES

1. In its original formulation, the knowledge-gap hypothesis states "as the infusion of mass media information into a social system increases, segments of the population with higher socioeconomic status tend to acquire this information at a faster rate than the lower status segments, so that the gap in knowledge between these segments tends to increase rather than decrease" (Tichenor, Donohue, and Olien 1970, 159–160).

2. Although beyond the scope of the present article, see Viswanath and Finnegan (1996) for a deeper discussion about the inherent, stable, and socioeconomic status (SES)–dependent—or at least strongly related—deficit in information processing underlying the knowledge gap hypothesis.

3. The Catalonia Internet Project is an interdisciplinary research program focused on the characteristics and development of the Information Society in Catalonia, directed by professors Manuel Castells and Imma Tubella, and conducted by researchers from the Internet Interdisciplinary Institute (IN3) of the Open University of Catalonia (UOC). See http://www.uoc.edu/in3/pic/eng.

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